Lower Cretaceous Calcareous Agglutinated Foraminifera from Southern Dobrogea, Romania. Part II. Early Cretaceous Cuneolinidae

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ABSTRACT

This paper presents a detailed study of the cuneoliniform group of foraminifera from the Lower Cretaceous (uppermost Berriasian to Lower Hauterivian) of Southern Dobrogea (Romania). Detailed study of the external morphology of the test and the inner structure in the primary chambers, enables new genera to be separated from the classical genus *Cuneolina*. Two new genera are described: *Scythiolina* n.gen. with the species *S. flabellii* n.sp., *S. infundibuliformae* n.sp., *S. crumenaeformae* n.sp., *S. cuneata* n.sp., *S. filiformae* n.sp., *S. camposauri* (Sartoni & Crescenti); and *Histerolina* n.gen. with the species: *H. paxilliformae* n.sp., *H. ellipsiformae* n.sp., *H. pileiformae* n.sp.

INTRODUCTION

In the Lower Cretaceous carbonate deposits of the northern Tethyan area, diverse agglutinated foraminiferal taxa are observed in thin sections, some of which are described and figured here as new genera and species. The major drawback of many micropalaeontological studies is the fact that a limited or very limited number of specimens are often used, and only a few of them represent an ideal section. Moreover, it is difficult to accept nowadays in the population concept of a species the practice of describing a new taxon using a reduced or very reduced number of specimens that do not enable other researchers to understand its intraspecific variability. The identification of a taxon by combining the features of a specimen axially sectioned with another transversally sectioned appears to be preferred. However, the external morphological features of the test, the shape, position, and structure of the aperture and the early stage are impossible to observe in thin section.

This is also the case with the so-called *Cuneolina* group from the Lower Cretaceous, for which an accurate and correct delineation of taxa (genera or species) cannot be accomplished without data offered by the external morphology and the aperture. This is because the inner structure visible in thin sections is practically identical (or very similar) in distinct morphological groups.

In the Valanginian-Hauterivian interval, the following species considered to belong to the genus *Cuneolina* have been described using only thin sections: *Cuneolina camposauri* Santoni & Crescenti, 1962, (Valanginian-Aptian), *Cuneolina laurentii* Santoni & Crescenti, 1962 (Valanginian-Aptian), *Cuneolina tenuis* Velic & Gušić, 1971 (probably Hauterivian).

Taking into account only the thin section information the diagnostical content of the genus *Cuneolina* was altered. The very rich and well-preserved material in the Lower Cretaceous of Southern Dobrogea proves that the inner structure of the test only cannot stand alone as a discriminatory feature. Studies of internal structure observed in thin section must be closely correlated with studies of external morphology on isolated specimens. Such studies show that inner structure may be identical or almost identical in specimens with a clearly different external morphology.

Study Area: Biostratigraphical remarks

Samples for this study were collected from outcrops situated on the right bank of the Danube River near Cernovoda, from a quarry in nearby Aliman, and from boreholes drilled between Poarta Alba and Ovidiu near Constanta (Figure 1). In southern Dobrogea the exposed Upper Berriasian to Valanginian marine deposits are succeeded by "Purbeckian" continental-lacustrine or lagoonal deposits. The latter are found in boreholes in the Carasu Valley. Lithologically, the Purbeckian facies includes anhydrite beds (more than 100 m thick in places) that overlie the Kimmeridgian limestones. These anhydrites are in turn overlain by alternating marls and multi-coloured clays that contain a rich association of ostracods (Cypridea) and characeans (*Flabellochara, Nodosoclavator, Clavator*) typical of the Upper Purbeckian. Detrital limestones with "Nerinea" and ostreids gradually appear at the top of these beds.

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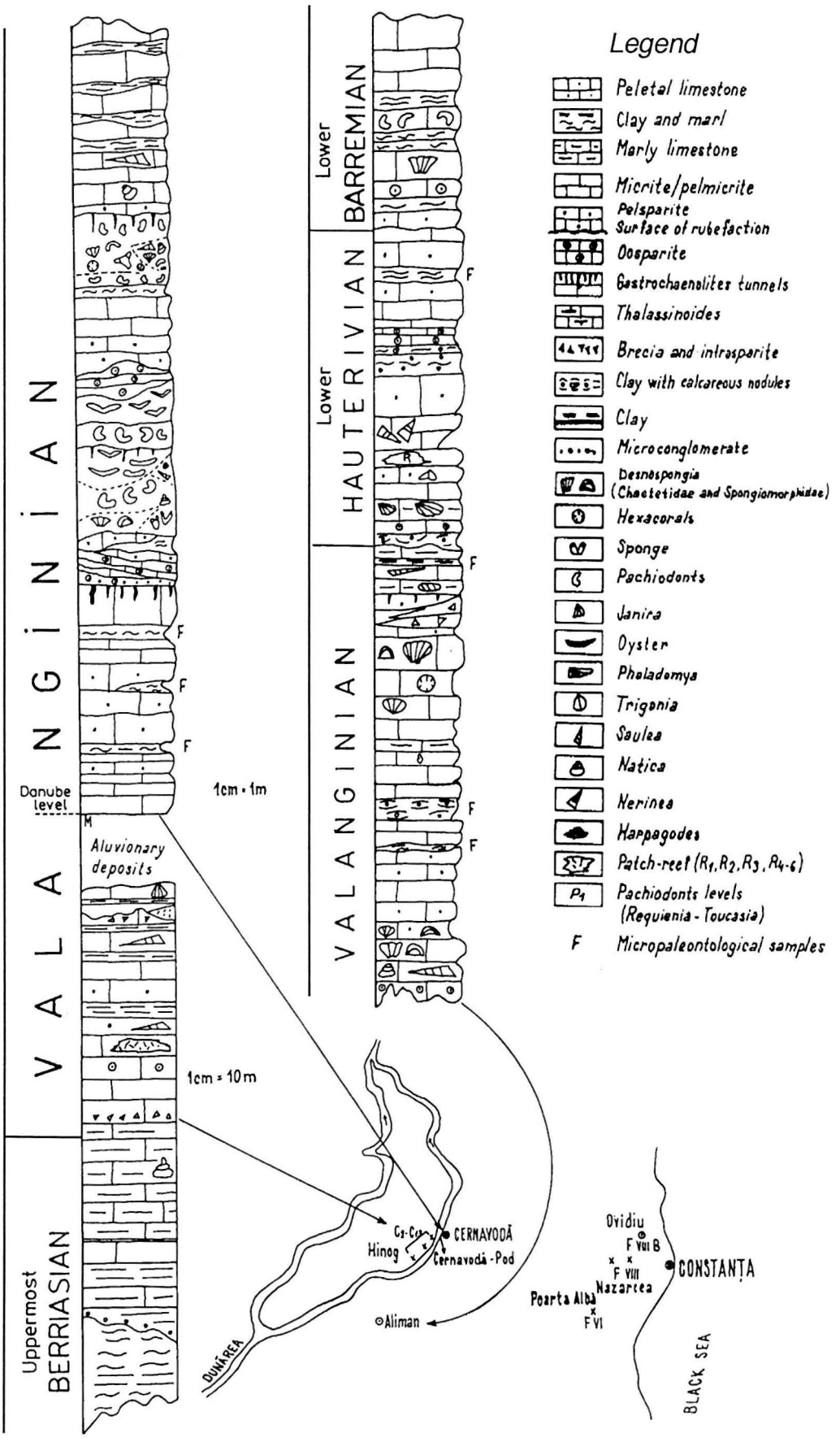

Figure 1. Lithostratigraphy and palaeontology of Lower Cretaceous deposits at Cernavoda Pod and Alimanu Quarry, after Dragastan (1978).

The zoogenic limestones crop out on the right bank of the Danube at Cernavoda as well as in the Alimanu-Adancata-Sipote area to the south.

The macrofauna of these deposits is quite rich, and represented by sponges, bivalves, gastropods and echinoids pointing to a typical Upper Berriasian to Valanginian Tethyan facies. Dragastan (1978) also cites a rich algal microflora represented by *Salpingoporella annulata* Carozzi, *S. steinhauseri* Conrad *et al.*, *Acicularia elongata* Carozzi, *Likanella bertheli* (Bernier) and *A. eolisacus inconstans* Radocic.

The microfauna associated with these deposits is also very rich. The numerous soft clay interbeds contain associations of foraminifera and ostracods. The most important species are *Anchyspirocyclina neumanae* Bernier *et al.*, *Ammocycloloculina erratica* (Jouk & Favre), *Everticyclammina virguliana* (Kochlin), *Pseudocyclammina lituus* (Yabe & Hanz) which sometimes reach mm-size, *Freixialina planispira* Ramalho, *Melatrokerion spirale* Gorbatchik, *Feurtilia frequens* Maync, *Gerochella cylindrica* Neagu, *Danubina obtusa* Neagu, *Verneuilinoides polonicus* (Cushman & Glazewski), as well as various species of *Arenobulimina, Decussoloculina, Axiopolina, Scythiloculina, Istriloculina, Rumanoloculina, Danubiella, Dobrogelina, Andersenolina, Ichnusella,* and diverse trocholinids.

The Lower Cretaceous cuneolinids

In 1839, Alcide d'Orbigny (in R. de la Sagra's volume) was the first to present the genus *Cuneolina.* In this monographic study of the Tertiary foraminiferal fauna in the Vienna Basin, d'Orbigny (using Upper Cretaceous material from Charente, France), described and figured this genus in detail. Since d'Orbigny's time, the concept regarding this genus has changed a great deal, as new data were successively added. The most accurate and complete description was given by Loeblich & Tappan (1987, p. 148) as a synthesis of the previous information on this subject:

> "Test free, compressed, conical to flabelliform, early trochospire of about five chambers followed by a very broad and low biserially arranged chambers, commonly compressed parallel to the plane of biseriality, interior subdivided into nearly rectangular chamberlets by radial partitions arising perpendicular to the outer wall and projecting inward toward the plane of biseriality and the horizontal partitions paralleling to the septa; wall agglutinated, imperforate, with reticulate subepidermal layer; aperture as a row of pores at the base of septal face".

From this description it is possible to separate the following features that can be used to delineate the genus *Cuneolina*:

- the very short and trochospiral early stage;
- the wall of the primary chambers is made up of an epidermal thin layer, followed by a hypodermal one which is thicker and has a reticulate structure;
- the compressed shape of the biserial part of the test parallel to the plane of biseriality;
- the aperture represented by a row of pores at the base of the apertural face of the last chamber;
- the interior of primary chambers is subdivided by vertical and horizontal septula into chamberlets; and
- the stratigraphic distibution of this genus is Barremian to Senonian.

Given all the above-mentioned features, in thin section one can notice only the inner structure of the primary chambers. This feature is not enough to allow the correct and clear discrimination of taxa, especially on Lower Cretaceous material.

The exceptionally rich and well-preserved material (including washed samples) from the uppermost Berriasian to Lower Hauterivian of Southern Dobrogea, makes it possible to obtain a clear correlation between external morphology, wall structure, and the inner structure of the primary chambers. This it was thus possible to establish that the studied material cumulates a number of the characteristic features of the genus *Cuneolina,* but also possesses distinctive features that enable the erection of new taxa. The inner structure of the primary chambers and the wall structure are features that confirm the affiliation of these taxa to the family Cuneolinidae.

By taking into account all the above mentioned features it was possible to separate the cuneoliniform species into three distinct groups:

1. The first group comprises specimens with a test compressed parallel to the plane of biseriality; with a very short planispiral early stage with 3-5 chambers, The apertural face of the last two chambers is clearly convex. The inner part of the primary chambers is divided only by radial-vertical septula. The wall is comprised of two distinct layers (*Scythiolina* n.gen. – Figure 2).

2. The second group brings together specimens with a biserial-conical or ellipsoconical test (never compressed) with a short planispiral early stage. The apertural face of the last two chambers is plano-concave with an acute or rounded-acute peripheral margin. The inner part of the primary chambers subdivided by vertical-

radial septula. The wall is comprised of two distinct layers (*Histerolina* n.gen. - Figure 3).

3. The third group, only externally homeomorphic to the other two, differs very clearly by its canaliculate wall structure and simple inner structure of primary chambers (without septula). This genus, named *Kaminskia* Neagu, 1999, comprises typical Textulariaceae, despite being unrelated to the Cenozoic genus *Textularia* (see Neagu, 1999).

SYSTEMATIC DESCRIPTIONS

Primary types of all species described herein are deposited in the micropalaeontological collections of the Laboratory of Paleontology, University of Bucharest (L.P.B) in cabinet IV.

Superfamily ATAXOPHRAGMIACEA Schwager, 1877
Family CUNEOLINIDAE Saidova, 1981
Subfamily CUNEOLININAE Saidova, 1981

Genus *Scythiolina* Neagu, n.gen.

Type species: ***Scythiolina flabellii***, Neagu, n.gen. n.sp.

Derivation of name. Scythia-ae = Scythia (during the reign of the Roman emperor Diocletian (284-305 AD) the area of Dobrogea was an independent province under the name Scythia Minor with Tomis as its capital city).

Description. Test free, small, smooth to slightly rough, flattened, flabelliform, triangular to elongated-triangular in outline. Early stage coiled in a very short planispiral with 3-5 chambers in the plane of biseriality. Primary chambers arched and broader than high. Aperture arched, slightly depressed. Wall comprised of a very thin compact epidermal layer and a thicker reticulate hypodermal layer. Interior of the primary chambers divided by vertical-radial septula into small rectangular chamberlets. Aperture an interiomarginal slit. The apertural face of the last two chambers with a pronounced convex shape (to the larger specimens the aperture might become crenellate but is never a row of apertural pores).

Remarks. By the flattened shape of the test and by the structure of the wall, this genus resembles *Cuneolina* d'Orbigny. It differs by the structures of the early stage, which is planispiral, by its reduced size, and by the absence of horizontal septula. The presence of an aperture with a crenellate shape in large-sized specimens suggests that this genus could be considered to be an ancestral stage of *Cuneolina*.

Stratigraphical distribution. Uppermost Berriasian to Lower Hauterivian.

Scythiolina flabellii Neagu, n.sp.

Plate 1, Figs 23-26; Plate 2, Figs 42-53; Plate 6, Figs 1-3; Plate 7, Figs 1-5

Derivation of name. Latin flabellum -i = fan (from the shape of the test).

Type level. Uppermost Berriasian to Lower Valanginian.

Type locality. Cernavoda, Ilia Barza's quarry, Southern Dobrogea.

Type specimens. The holotype (Plate 1, Figs 25-26) is registered as L.P.B.IV, nr. 11193; paratypes as 11194 - 11196.

Description. Test small, free, strongly flattened, flabelliform. Early stage very short and planispiral with 3-5 chambers; early part of the biserial stage with a conical-elliptical shape from which chambers become gradually flattened and progressively more arched to crescentic, lower then broad. Sutures weakly depressed. Apertural face of the last two chambers convex with a rounded external periphery. Aperture a low interiomarginal slit. Wall structure with a very thin, compact epidermal layer and a thicker hypodermal reticulate layer. Interior of the chambers (primary ones) divided by vertical-radial septula into rectangular chamberlets.

Dimensions. Holotype; length 0.6 mm; breadth 0.48 mm; thickness 0.1-0.17 mm; paratypes (figured specimens): length 0.46-0.63 mm; breadth 0.40-0.60 mm; thickness 0.12-0.24 mm.

Remarks. This species is distinguished by its flabelliform shape.

Occurrence. Southern Dobrogea, Cernavoda Pod, right bank of the Danube River; Ilie Barza's quarry; ISPH drillings F. VIII Nazarcea -60.50 m; C.2 Hinog –42 m –43 m; C.4 Hinog –47.20 m; C.12 Hinog –92.60 –93 m.

Stratigraphic distribution. Uppermost Berriasian to Lower Valanginian.

Scythiolina infundibuliformae Neagu, n.sp.

Plate 1, Figs 1-22; Plate 4, Fig 45; Plate 6, Figs 6-10; Plate 7, Figs 21-24.

Derivation of name. Latin infundibulum, -i = funnel (from the general outline of the test).

Type locality. Cernavoda, Ilie Barza's quarry, Southern Dobrogea.

Type specimens. The holotype (Plate 1, Figs 12-14) is registered as L.P.B.IV nr. 11212; paratypes as 11213 - 11218.

Description. Test free, with an equilateral-triangle outline. Short planispiral early stage with 3-5 chambers; biserial stage with chambers growing rapidly in breadth giving the test a flattened funnel shape; arcuate. Sutures slightly depressed. Apertural face of the last two chambers convex with a rounded external periphery. Aperture interiomarginal, a low elongated slit. Wall structure with

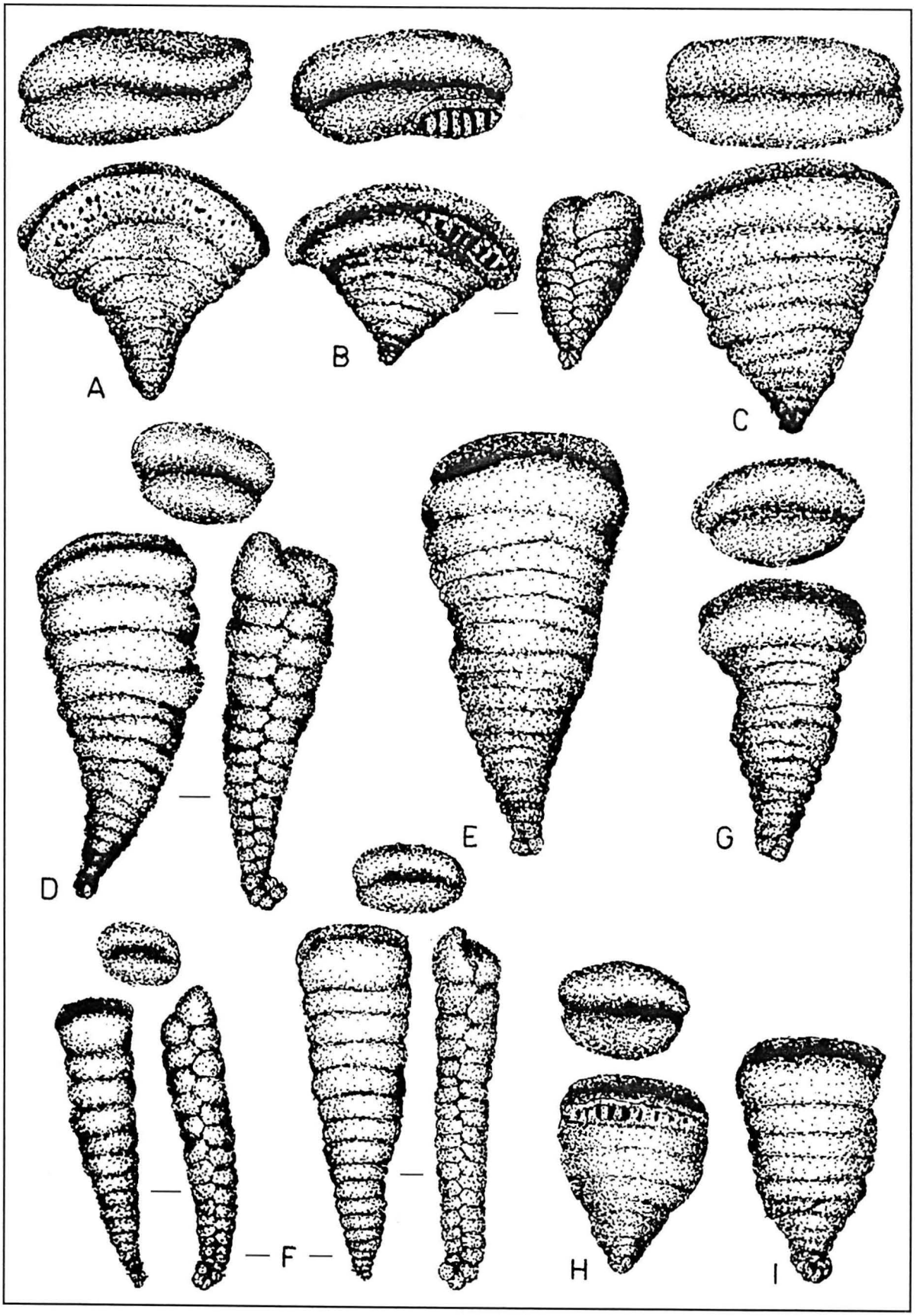

Figure 2. Schematic shape of different species of the genus *Scythiolina*: **A.** *Scythiolina flabellii* Neagu, n.sp.; **B.** *Scythiolina infundibuliformae* Neagu, n.sp.; **C.** *Scythiolina camposauri* (Sartoni & Crescenti, 1962); **D-E.** *Scythiolina cuneata* Neagu, n.sp.; **F.** *Scythiolina filiformae* Neagu, n.sp.; H-I. *Scythiolina crumenaeformae* Neagu, n.sp.

two distinct layers, a thin, compact epidermal one and a thicker reticulate hypodermal one. Interior of the primary chambers divided by vertical-radial septula into rectangular chamberlets.

Dimensions. Holotype length 0.43 mm; breadth 0.46 mm; thickness 0.24 mm; paratypes (figured specimens): length 0.36-0.43 mm; breadth 0.39-0.48 mm; thickness 0.17-0.24 mm.

Remarks. By the equilateral-triangle shape of the test, as a flattened funnel, this species differs from *S. flabellii* n.sp.

Occurrence. Southern Dobrogea, Cernavoda Pod, right bank of the Danube River, Ilie Barza's Quarry; ISPH drillings F.VIII Nazarcea –68.50; F.IV Poarta Alba -61.50, –64.50 m.

Stratigraphic distribution. Uppermost Berriasian to Lower Valanginian.

Scythiolina crumenaeformae Neagu, n.sp.

Plate 1, Figs 40, 45-50; Plate 2, Figs 30-41; Plate 5, Figs 29-42; Plate 6, Figs 4-5; Plate 7, Figs 11-15

Derivation of name. Latin crumena -ae = money purse (from the general shape of the test).

Type level. Uppermost Berriasian.

Type locality. Southern Dobrogea, ISPH drillings F. IV Poarta Alba 61.50-64.50 m.

Type specimens. The holotype (Plate 5, Figs 33-34) is registered as L.P.B.IV 11207; paratypes as 11208 - 11211.

Description. Test small, flattened, with a very short planispiral early stage with 3-5 chambers. Biserial stage with an acute shape in the lower third, after which chambers grow suddenly and remain constant in dimensions, giving a purse shape to the test. Sutures straight or weakly arcuate. Apertural face of the last two chambers convex. Aperture a low straight interiomarginal slit. Wall with two distinct epidermal and hypodermal layers; interior of the chambers subdivided by vertical-radial septula into rectangular chamberlets.

Dimensions. Holotype: length 0.39 mm; breadth 0.29 mm; thickness 0.14 mm; paratypes (figured specimens): length 0.43 - 0.55 mm; breadth 0.21 - 0.31 mm; thickness 0.14 - 0.21 mm.

Remarks. This species differs from *S. cuneata* Neagu, n.sp. by the "purse" shape of the test and especially by the sudden growth in the breadth of the chambers after the lower third part of the test.

Occurrence. Southern Dobrogea, Cernavoda Ilie Barza's Quarry; ISPH drillings F. IV Poarta Alba –61.50 to -64.50 m, F. VIII Nazarcea -60.50 m.

Stratigraphic distribution. Uppermost Berriasian.

Scythiolina cuneata Neagu, n.sp.

Plate 1, Figs 37-39, 51-67; Plate 4, Figs 59-63, Plate 5, Figs 43-57; Plate 6, Figs 14-20; Plate 7, Figs 16-19

Derivation of name. Latin cunatus -a -um = wedge (from the wedge shape of the test).

Type level. Lower Valanginian.

Type locality. Southern Dobrogea, Cernavoda Pod, right bank of the Danube River.

Type specimens. The holotype (Plate 1, Figs 54-66) is registered as L.P.B.IV 11200; paratypes as 11201 - 11206.

Description. Test medium to large-sized with an elongate to very elongated trianglular shape. Early stage with 3-5 planispiral chambers followed by a flattened biserial stage with more low than broad chambers growing gradually in breadth, thus giving the test a wedge shape. Sutures weakly depressed and arcuate. Wall structure with an external very thin compact epidermal layer and a thicker reticulate hypodermal one. Interior of the primary chambers divided by vertical-radial septula into simple rectangular chamberlets. Apertural face of the last two chambers convex; aperture a low, elongated interiomarginal slit.

Dimensions. Holotype length 0.74 mm; breadth 0.31 mm; thickness 0.21 mm; paratypes (figured specimens) length 0.29 - 0.74 mm; breadth 0.19 - 0.36 mm; thickness 0.14 - 0.21 mm.

Remarks. This species differs from the *S. filiformae* by the typical "wedge" shape of the test.

Occurrence. Southern Dobrogea, Cernavoda Pod, right bank of the Danube River, Ilie Barza's quarry; ISPH drillings F. VIII Nazarcea –68.50 m, C.4 Hinog –47 m.

Stratigraphic distribution. Uppermost Berriasian to Valanginian.

Scythiolina filiformae Neagu, n.sp.

Plate 1, Figs 56-59, 68-70; Plate 2, Figs 1-17; Plate 6, Figs 11-13; Plate 7, Fig. 20

Derivation of name. Latin filum -i = thread; formae= appearance, shape (from the strongly elongated shape of the test).

Type level. Lower Hauterivian.

Type locality. Southern Dobrogea, Alimanu quarry.

Type specimens. The holotype (Plate 2, Figs 15-17) is registered as L.P.B.IV nr. 11197; paratypes as 11198 - 11199.

Description. Test filiform, strongly elongate, flattened parallel to the plane of biseriallity. Early stage very short, with 3-5 planispiral chambers; followed by a textulariiform biserial stage. Chambers weakly arcuate to straight, lower than broad, with slightly depressed sutures. Aperture interiomarginal, a low slit. Apertural face of the last two chambers convex. The chamber interior subdivided by vertical-radial septula into rectangular chamberlets. Wall with a thin, compact epidermal layer and a thicker and reticulate hypodermal one.

Dimensions. Holotype length 0.68 mm; breadth 0.19 mm; thickness 0.13 mm; paratypes (figured specimens); length 0.58-0.80 mm; breadth 0.17-0.25 mm; thickness 0.13-0.15 mm.

Remarks. This species is very well delineated by the general filiform shape of the test.

Occurrence. Southern Dobrogea, Alimanu quarry, Cernavoda Pod, right bank of the Danube River.

Stratigraphic distribution. Lower Valanginian to Lower Hauterivian.

Scythiolina camposauri (Sartoni & Crescenti, 1962)

Plate 1, Figs 41-44, Plate 2, Figs 18-29; Plate 4, Figs 50, 54; Plate 7, Figs 7-10

Cuneolina camposauri Sartoni & Crescenti, 1962, p. 275, pl. 48, figs 1-6.

Dimensions. (Figured specimens), length 0.50-0.67 mm; breadth 0.40-0.65 mm; thickness 0.19-0.24 mm.

Remarks. As already pointed out, it is difficult to identify by thin section alone (parallel with the plane of biseriality or perpendicular to it) the correct affiliation of the species illustrated by Sartoni & Crescenti to the species described above. It is here arbitrarily considered that the specimens with an approximately equilateral triangle shape could correspond, by the shape of the thin section, with Sartoni & Crescenti's species.

Occurrence. Southern Dobrogea, Cernavoda Pod, right bank of the Danube River, Ilie Barza's quarry, ISPH drillings F. VIII Nazarcea –68.50 m, F. IV Poarta Alba –61.50 to -64.50 m, C. 4 Hinog –47 m; Alimanu quarry.

Stratigraphic distribution: Uppermost Berriasian to Lower Hauterivian.

Genus *Histerolina* Neagu, n.gen.

Type species: *Histerolina pileiformis* Neagu, n.sp.

Derivation of name. Hister, or Ister -tri = Roman name for the Lower Danube in Vergilius' writings.

Description. Test small, smooth to weakly rough, conical to ellipso-conical, never flattened. Early stage very short with 3-5 planispiral chambers. Sutures weakly depressed and arcuate. Wall structure of the test presents an epidermal thin, compact layer and a thicker reticulate hypodermal one. The apertural face of the last two chambers presents a clear flat-concave shape with an external acute periphery. The interior of the primary chambers is subdivided by radial-vertical septula into rectangular chamberlets. Aperture interiomarginal, a simple elongated slit becoming crenelated in larger specimens but never as a basal row of pores.

Remarks. This genus differs from *Scythiolina* by the general conical or ellipso-conical shape of the test (never flattened) and by the flat-concave apertural face with an acute peripheral margin. Differs from *Pseudotextulariella salevensis* Charrolais, Brönnimann, Zaninetti, by the early stage, wall structure and the vertical-radial septula. From *Montsalevia* Zaninetti, Salvini, Barnard, Charrolais, 1987 (superficially described in thin section) it differs by the structure of the early stage and the wall structure. Because of its general conical test shape and the flat concave apertural face, this genus could represent the origin of *Sabaudia*, from which it differs by the structure of the early stage and wall structure.

Stratigraphic distribution. Uppermost Berriasian to Lower Hauterivian.

Histerolina pileiformae Neagu, n.sp.

Plate 2, Figs 54-61; Plate 3, Figs 59-68; Plate 4, Figs 22-44; Plate 5, fig. 58; Plate 6, Figs 21-26; Plate 7, Figs 6, 25-34.

Derivation of name. Latin pileus -i = a cap made of wool worn by liberated slaves (after the shape of the test).

Type level. Uppermost Berriasian to Lower Valanginian.

Type locality. Southern Dobrogea, ISPH drillings C.12 Hinog –92.60 to –93 m.

Type specimens. The holotype (Plate 4, Figs 28-29) is registered as L.P.B.IV nr. 11221; paratypes as 11222 - 11229.

Description. Test ellipto-conical, widened. Early stage planispiral, with 3-5 chambers growing rapidly in breadth. Sutures weakly arcuate and depressed. Apertural face of the last two chambers flat-concave with an acute or acute-rounded peripheral margin. Aperture interiomarginal, ordinarily an elongated slit, but in robust specimens a crenellated upper lip may be present. Wall with a thin compact epidermal layer and a thicker inner reticulate one; interior of the primary chambers subdivided by vertical-radial septula into rectangular chamberlets.

Dimensions. Holotype length 0.39 mm; breadth 0.43 mm; thickness 0.29 mm; paratypes (figured specimens); length 0.29-0.60 mm; breadth 0.34-0.77 mm; thickness 0. 26-0.40 mm.

Remarks. This species differs from *H. paxilliformae* by the general shape of the test. The transversal and longitudinal sections show the affinity of this species to *S. camposauri*, from which it differs by the external morphology of the test.

Occurrence. Southern Dobrogea, Cernavoda Pod, right bank of the Danube River, Ilie Barza's quarry; ISPH drillings C.4 Hinog –44.20 to –45 m.; -47 m., C.12 Hinog, -92.50 to –93 m.; F.VIII Nazarcea –68.50 m.

Stratigraphic distribution. Uppermost Berriasian to Lower Valanginian.

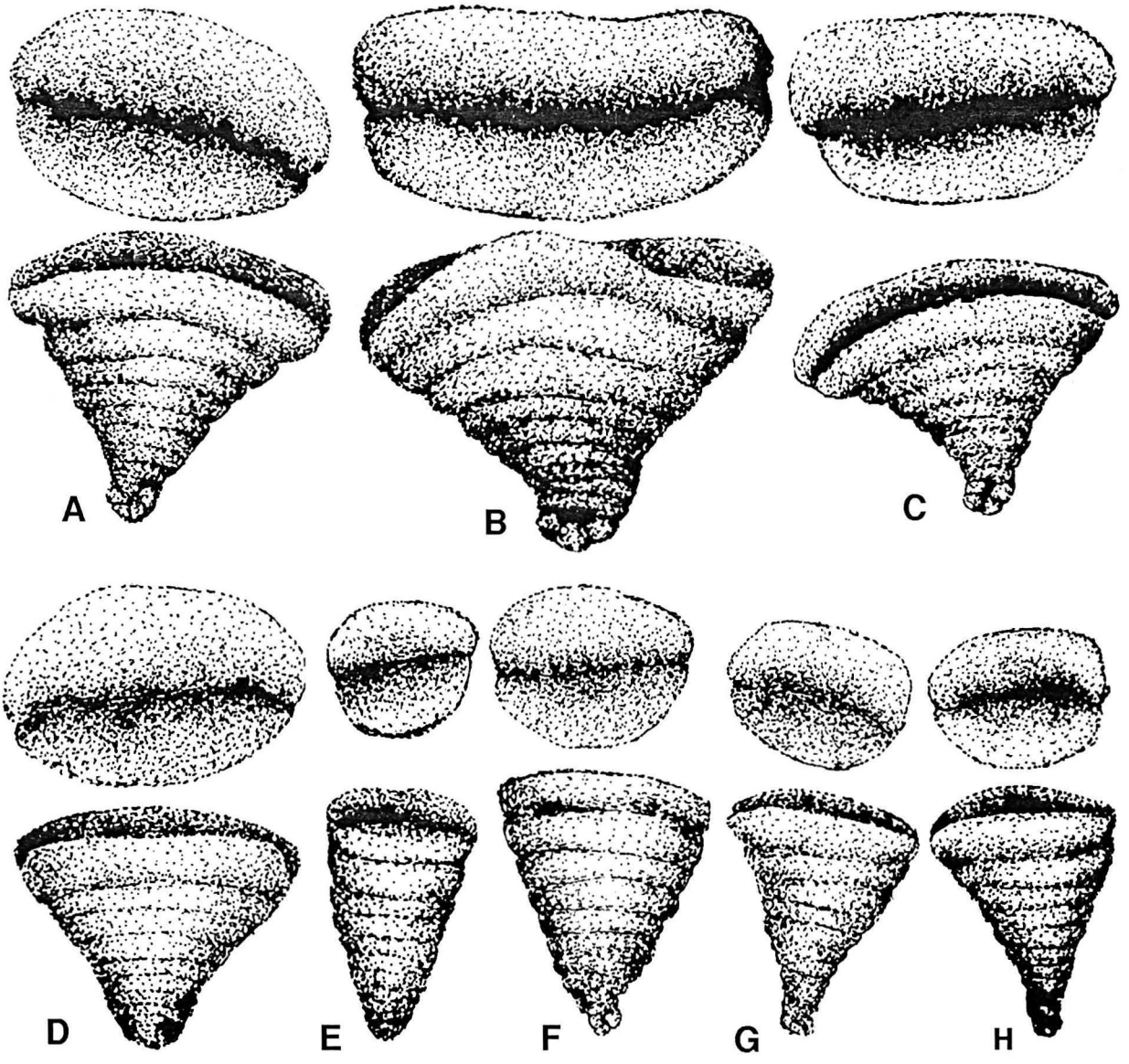

Figure 3. Schematic shape of the different species of the genus *Histerolina*: **A-D.** *Histerolina pileiformae* Neagu, n.sp.; **E-H.** *Histerolina paxilliformae* Neagu, n.sp.; **F-H.** *Histerolina ellipsiformae* Neagu, n.sp.

Histerolina paxilliformae Neagu, n.sp.

Plate 3, Figs 1-50, 53-54; Plate 4, Figs 1-12; Plate 6, Figs 27-29; Plate 7, Figs 35-38.

Derivation of name. Latin paxillus -i = stake (from the shape of the test).

Type locality. Southern Dobrogea, ISPH drillings C.12 Hinog, -92,50 to –93 m.

Type level. Uppermost Berriasian.

Type specimens. The holotype (Plate 3, Figs 29-30) is registered as L.P.B.IV. nr. 11230; paratypes as 11231 - 11235.

Description. Test small, conical. Early stage very short, planispiral, with 3-5 chambers, followed by a conical biserial stage with chambers growing gradually in dimensions. Sutures weakly arcuate or smooth. The apertural face of the last two chambers is flat-concave with an acute external margin. Interiomarginal aperture becomes crenellate in large specimens. Interior of the chambers divided by a vertical-radial septula into rectangular chamberlets. Wall structure with two layers, a thin, compact epidermal one, and a thicker reticulate hypodermal one.

Dimensions. Holotype length 0.36 mm; breadth 0.31 mm; thickness 0.29 mm; paratypes (figured specimens); length 0.21-0.36 mm; breadth 0.21-0.34 mm; thickness 0.17-0.29 mm.

Remarks. The conical shape of the test is reminiscent of the genus *Marssonella*. This species is well delineated from *H. ellipsiformae*. It differs from *Montsalvenia* by the features of the test.

Occurrence. Southern Dobrogea, Cernavoda Pod, right bank of the Danube River, ISPH drillings F.IV

Poarta Alba –61.50 to -65.50 m; F.VIII Nazarcea -60.50m.; C.2 Hinog -42 to –43 m.; C.4 Hinog –47 m.; C.12 Hinog –92.60 to –93 m.; C.13 Hinog –49 m.

Stratigraphic distribution. Uppermost Berriasian to Lower Valanginian.

Histerolina ellipsiformae Neagu, n.sp.

Plate 3, Figs 51-52, 55-58; Plate 4, Figs 13-21, 46-49, 51-52, 55-58; Plate 5, Figs 1-28; Plate 7, Figs 39-43

Derivation of name. Latin ellipsis -is = ellipse, ellipsis (from the outline of the apertural face).

Type locality. Southern Dobrogea.

Type level. Uppermost Berriasian to Lower Valanginian

Type specimens. The holotype (Plate 5, Figs 11-12) is registered as L.P.B.IV. nr. 11236; paratypes as 11237 - 11244.

Description. Test small, free, conical, weakly flattened with an elliptical outline of the apertural face. Early stage planispiral with 3-5 chambers followed by a biserial stage with chambers growing gradually in dimensions. Sutures weakly depressed and arcuate. Apertural face elliptical and flat-concave with an acute-rounded external margin. Aperture interiomarginal, a low slit with a simple or crenellate upper lip. Interior of the primary chambers divided by radial-vertical septula into rectangular chamberlets. Wall structure with a very thin compact epidermal layer and a thicker reticulate internal one.

Dimensions. Holotype; length 0.40 mm; breadth 0.43 mm; thickness 0.26 mm; paratypes (figured specimens) length 0.24-0.48 mm; breadth 0.29-0.53 mm; thickness 0.21-0.40 mm.

Remarks. This species differs from *H. paxilliformae* by the accentuated ellipsoidal shape of the apertural face.

Occurrence. Southern Dobrogea, Cernavoda Pod, right bank of the Danube River, Ilie Barza's quarry; ISPH drillings F.VIII Nazarcea -60.50 m.; C.4 Hinog –47.20 m.; C.12 Hinog –92.60 to –93 m.; C.13 Hinog –49 m.; Alimanu quarry.

Stratigraphic distribution. Uppermost Berriasian to Lower Hauterivian.

Biostratigraphy and evolution

The abundance of specimens and species richness of the Cuneolininae group in the Berriasian to Early Hauterivian interval is strong evidence that the evolution probably started on the Late Jurassic carbonate platforms. The assemblages from Lower Cretaceous deposits of Southern Dobrogea represent the latter part of this evolution because very few of these species cross into the Hauterivian stage. Judging from test morphology, is possible to accept that the *Scythiolina flabellii* group could be considered to represent the ancestor of the Barremian to Aptian *Cuneolina henssoni* group (Figure 4). Additionally, *Scythiolina cuneata* may represent the ancestor of the *Cuneolina axinoides* group. Also based on its morphology, the genus *Histerolina* should be considered an ancestor of the Barremian-Aptian genus *Sabaudia*.

AKNOWLEDGEMENTS

This study would not have been possible without samples from the ISPH drillings offered to the author by Prof. Dr. Ion Bancila, Member of the Romanian Academy, to whom he expresses his gratitude. Also the author thanks Dr. Mike Kaminski (London) who reviewed this article; to Dr. Paulian Dumitrica (Switzerland) for the SEM photographs; to Marius Stoica (Laboratory of Paleontology, Bucharest) for the photographs of thin sections; and to Prof. Dr. Wolfgang Kuhnt (Kiel) for his comments on an earlier draft of the manuscript.

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PLATE 1

(Camera lucida drawings; all specimens x60)

Figs 1-22. ***Scythiolina infundibuliformae*** Neagu, n.sp.; Figs 12-14, Uppermost Berriasian, Cernavoda, Ilie Barza's quarry, Holotype, L.P.B.IV.11212; Figs 1-11, 15-22, Uppermost Berriasian Cernavoda, Ilie Barza's quarry, paratypes, L.P.B.IV.11213.

Figs 23-36. ***Scythiolina flabellii*** Neagu, n.sp.; Figs 25-26, Uppermost Berriasian, Cernavoda, Ilie Barza's quarry, Holotype, L.P.B.IV.11193; Figs 23-24, 27-36, Uppermost Berriasian, Cernavoda, Ilie Barza's quarry, paratypes, L.P.B.IV.11194.

Figs 37-39, 51-55, 60-67. ***Scythiolina cuneata*** Neagu, n.sp.; Figs 54-55, Lower Valanginian, Cernavoda Pod, right bank of the Danube River, Holotype, L.P.B.IV.11200; Figs 37-39, Uppermost Berriasian, Cernavoda, Ilie Barza's quarry, paratypes, L.P.B.IV.11201; Figs 51-53, Uppermost Berriasian, ISPH drillings F.IV. Poarta Alba –61.50 m to -64.50 m, L.P.B.IV.11203; Figs 60-67, Lower Valanginian, Cernavoda Pod, right bank of the Danube River, L.P.B.IV.11201.

Figs 56-59, 68-70. ***Scythiolina filiformae*** Neagu, n.sp.; Figs 56-59, Lower Valanginian, Cernavoda Pod, right bank of the Danube River, paratypes, L.P.B.IV.11199; Figs 68-70, Lower Hauterivian, Alimanu quarry, L.P.B.IV.11198.

Figs 41-44. ***Scythiolina camposauri*** (Sartoni & Crescenti, 1962), Uppermost Berriasian, Cernavoda, Ilie Barza's quarry, hypotypes, L.P.B.IV.11219.

Figs 40, 45-50. ***Scythiolina crumenaeformae*** Neagu, n.sp., Uppermost Berriasian, ISPH drillings F.IV. Poarta Alba, -61,50 m to -64,50 m, paratypes, L.P.B.IV.11208.


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PLATE 2

(Camera lucida drawings; all specimens x60)

Figs 1-17. ***Scythiolina filiformae*** Neagu, n.sp., Figs 1-14, Lower Hauterivian, Alimanu quarry, paratypes, L.P.B.IV.11198. Figs 15-17, Lower Hauterivian, Alimanu quarry, Holotype, L.P.B.IV.11197;

Figs 18-29. ***Scythiolina camposauri*** (Sartoni & Crescenti, 1962), Uppermost Berriasian, ISPH drillings F.VIII Nazarcea –68.50 m, hypotypes, L.P.B.IV.11210.

Figs 30-41. ***Scythiolina crumenaeformae*** Neagu, n.sp. Uppermost Berriasian, ISPH drillings F. IV Poarta Alba -61.50-64.50 m.

Figs 42-53. ***Scythiolina flabelii*** Neagu, n.sp., Uppermost Berriasian, ISPH drillings, F.VIII. Nazarcea –68.50 m, paratypes, L.P.B.IV.11195.

Figs 54-61. ***Histerolina pileiformae*** Neagu, n.sp., Lower Valanginian, Cernavoda Pod, right bank of the Danube River, paratypes, L.P.B.IV.11224.

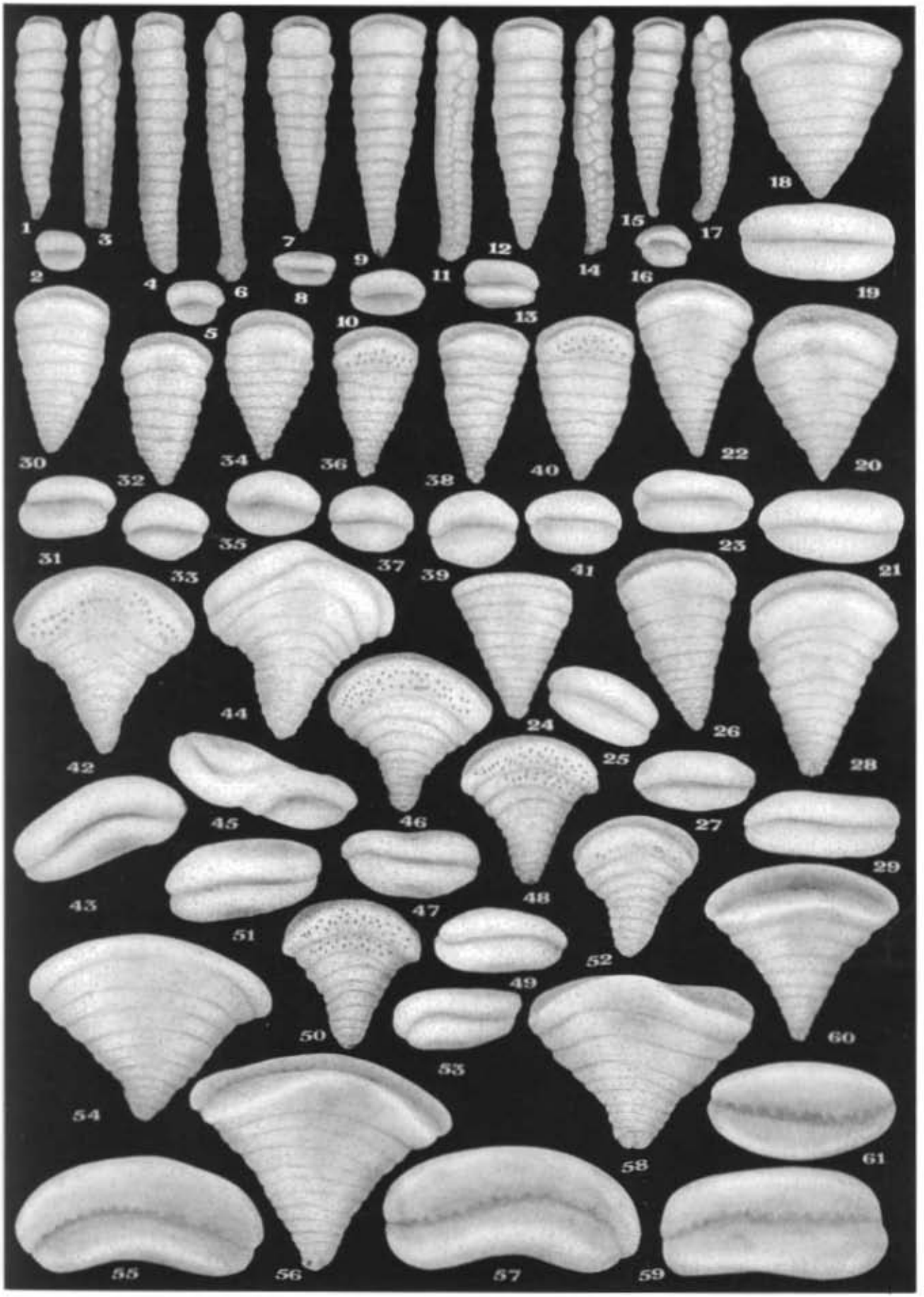
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PLATE 3

(Camera lucida drawings; all specimens x60)

Figs 1-50, 53-54. ***Histerolina paxilliformae*** Neagu, n.sp., Figs 1-14, Uppermost Berriasian, ISPH drillings C.13 Hinog -49 m, paratypes, L.P.B.IV. 11231; Figs 15-26, Uppermost Berriasian, ISPH drillings C.4 Hinog –47.20 m, L.P.B.IV.11233; Figs 27-28, Uppermost Berriasian, ISPH drillings C.12 Hinog –92.60 m to -93 m, L.P.B.IV.11231; Figs 29-30, Uppermost Berriasian, ISPH drillings, C.12 Hinog, -92.60 m to -93 m, Holotype, L.P.B.IV.11230; Figs 31-44, Uppermost Berriasian, ISPH drillings C.12 Hinog –92.60 m to -93 m, L.P.B.IV.11231; Figs 45-50, 53-54, Uppermost Berriasian ISPH drillings F.VIII Nazarcea –68.50 m, L.P.B.IV.11234.

Figs 51-52, 55-58. ***Histerolina ellipsiformae*** Neagu, n.sp., Uppermost Berriasian, ISPH drillings F.VIII Nazarcea –68.50 m, paratypes, L.P.B.IV.11237.

Figs 59-68. ***Histerolina pileiformae*** Neagu, n.sp., Lower Valanginian, Cernavoda Pod, right bank of the Danube River, paratypes, L.P.B.IV.11223.

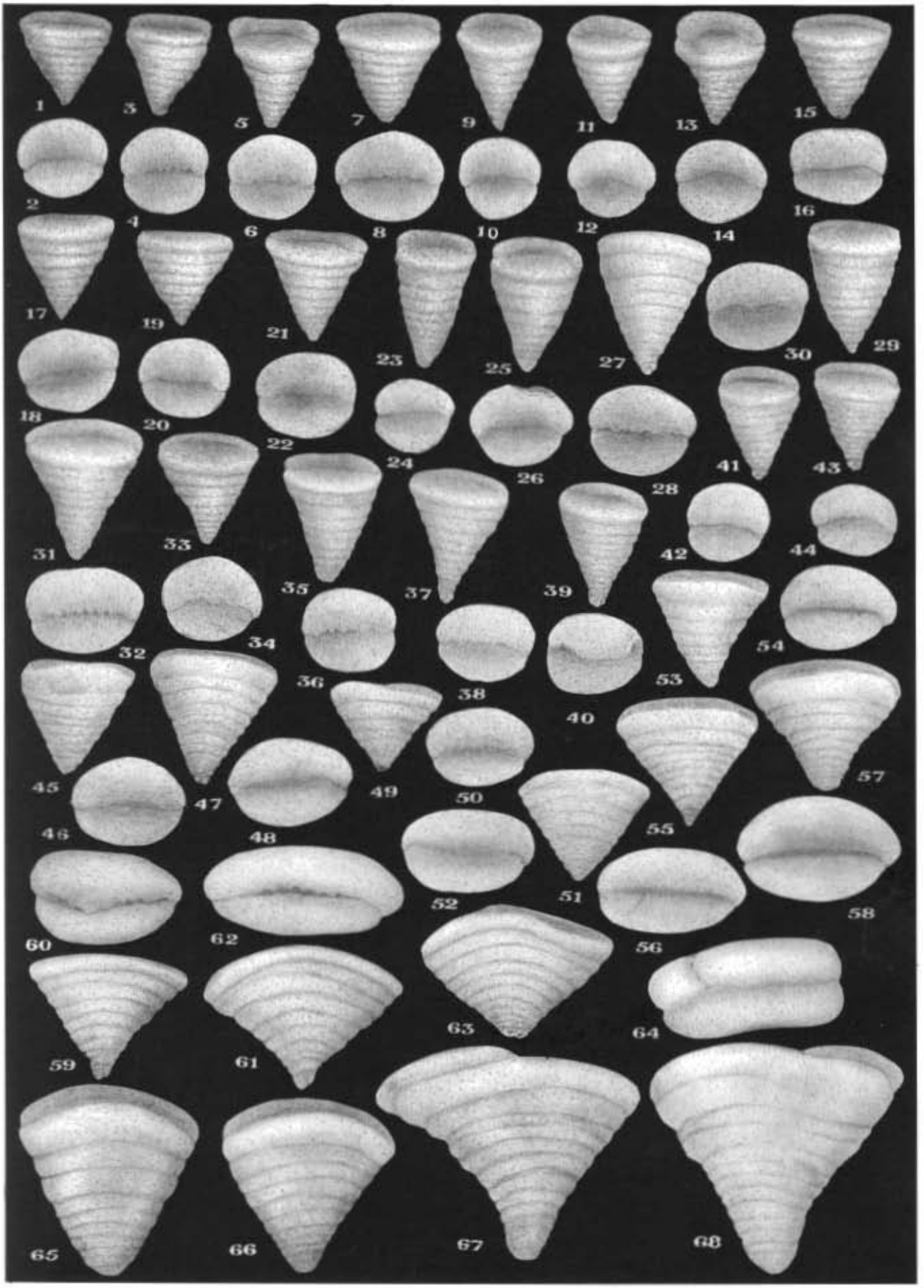
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PLATE 4

(Camera lucida drawings; all specimens x60)

Figs 1-12. ***Histerolina paxilliformae*** Neagu, n.sp., Uppermost Berriasian, ISPH drillings C.13 Hinog -49 m., paratypes, L.P.B.IV.11232.

Figs 13-21, 46-49, 51-52, 55-58. ***Histerolina ellipsiformae*** Neagu, n.sp. Figs 13-21, Uppermost Berriasian, ISPH drillings C.12 Hinog –92.60 m to -93 m, paratypes L.P.B.IV.11241; Figs 46-49, 51-52, 55-58, Uppermost Berriasian, ISPH drillings F.VIII Nazarcea –68.50 m., L.P.B.IV.11237.

Figs 22-44. ***Histerolina pileiformae*** Neagu, n.sp., Figs 22-27, 35, Uppermost Berriasian ISPH drillings C.12 Hinog –92.60 m to -93 m, paratypes, L.P.B.IV.11222; Figs 28-29, Uppermost Berriasian, ISPH drillings C.12 Hinog –92.60 m to -93 m, Holotype, L.P.B.IV.11221; Figs 34-36, Lower Valanginian, Cernavoda Pod, right bank of the Danube River, L.P.B.IV.11223.

Figs 50, 54. ***Scythiolina camposauri*** (Sartini & Crescenti, 1962), Uppermost Berriasian, ISPH drillings F.VIII Nazarcea –68.50 m, hypotypes, L.P.B.IV.11220.

Figs 59-63. ***Scythiolina cuneata*** Neagu, n.sp., Lower Valanginian, Cernavoda Pod, right bank of the Danube River, paratypes, L.P.B.IV.11202.

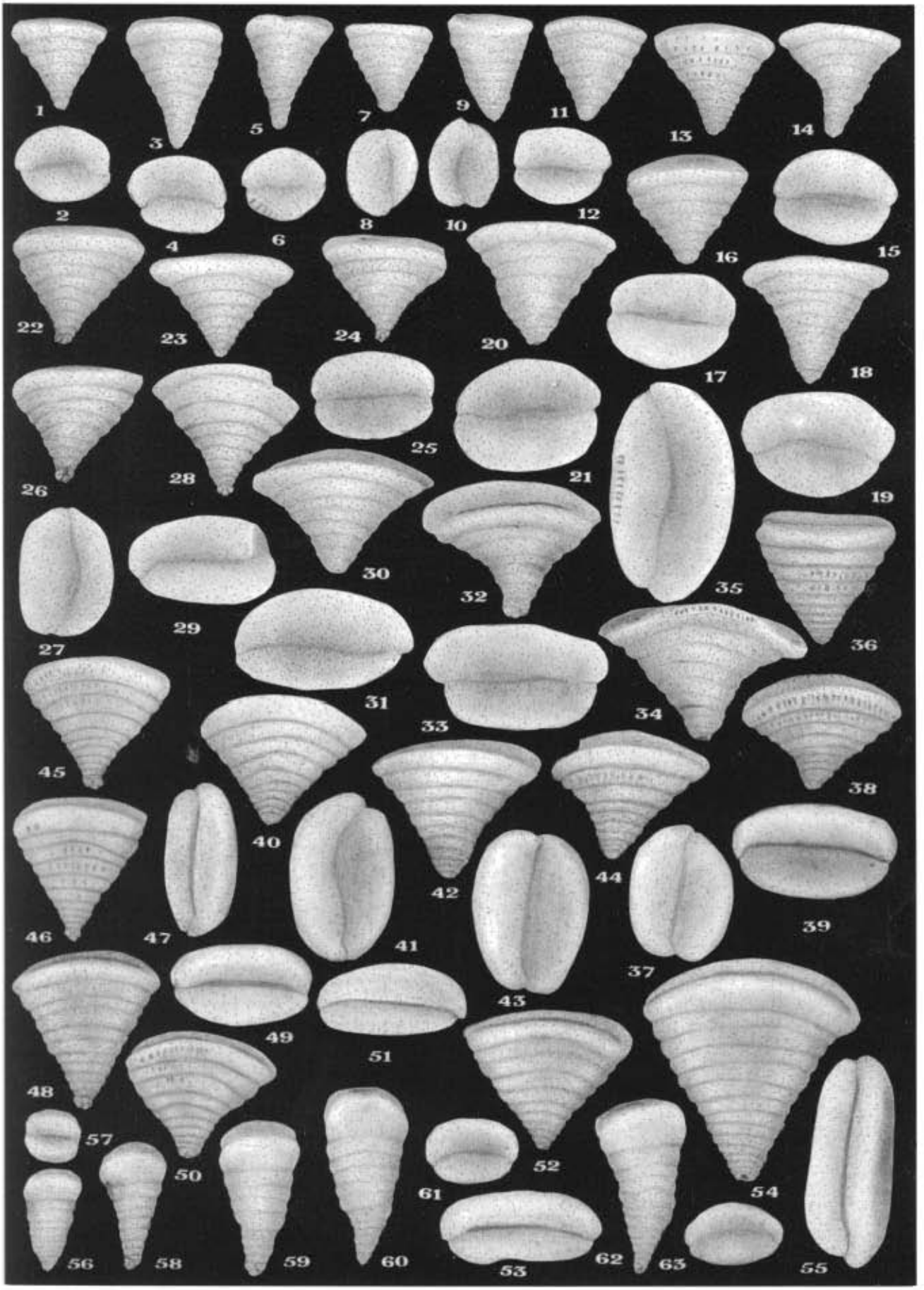
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PLATE 5

(Camera lucida drawings; all specimens x60)

Figs 1-28. ***Histerolina ellipsiformae*** Neagu, n.sp., Figs 1-10, 13-16, Uppermost Berriasian, ISPH drillings F.VIII –68.50 m, paratypes, L.P.B.IV.11237; Figs 11-12, Uppermost Berriasian, ISPH drillings F.VIII Nazarcea –68.50 m, Holotype, L.P.B.IV.11236; Figs 17-28, Lower Valanginian, Cernavoda Pod, right bank of the Danube River, L.P.B.IV.11238.

Figs 29-42. ***Scythiolina crumenaeformae*** Neagu, n.sp., Figs 33-34, Uppermost Berriasian, ISPH drillings F.IV Poarta Alba –61.50 m., Holotype, L.P.B.IV.11207.

Figs 43-57. ***Scythiolina cuneata*** Neagu, n.sp. Lower Valanginian, Cernavoda Pod, right bank of the Danube River, paratypes, L.P.B.IV.11201 (Figs 56-57, sectioned specimens in Pl. 7).

Figs 58. ***Histerolina pileiformae*** Neagu, n.sp. Lower Valanginian, Cernavoda Pod, right bank of the Danube River, paratypes, L.P.B.IV.11223.

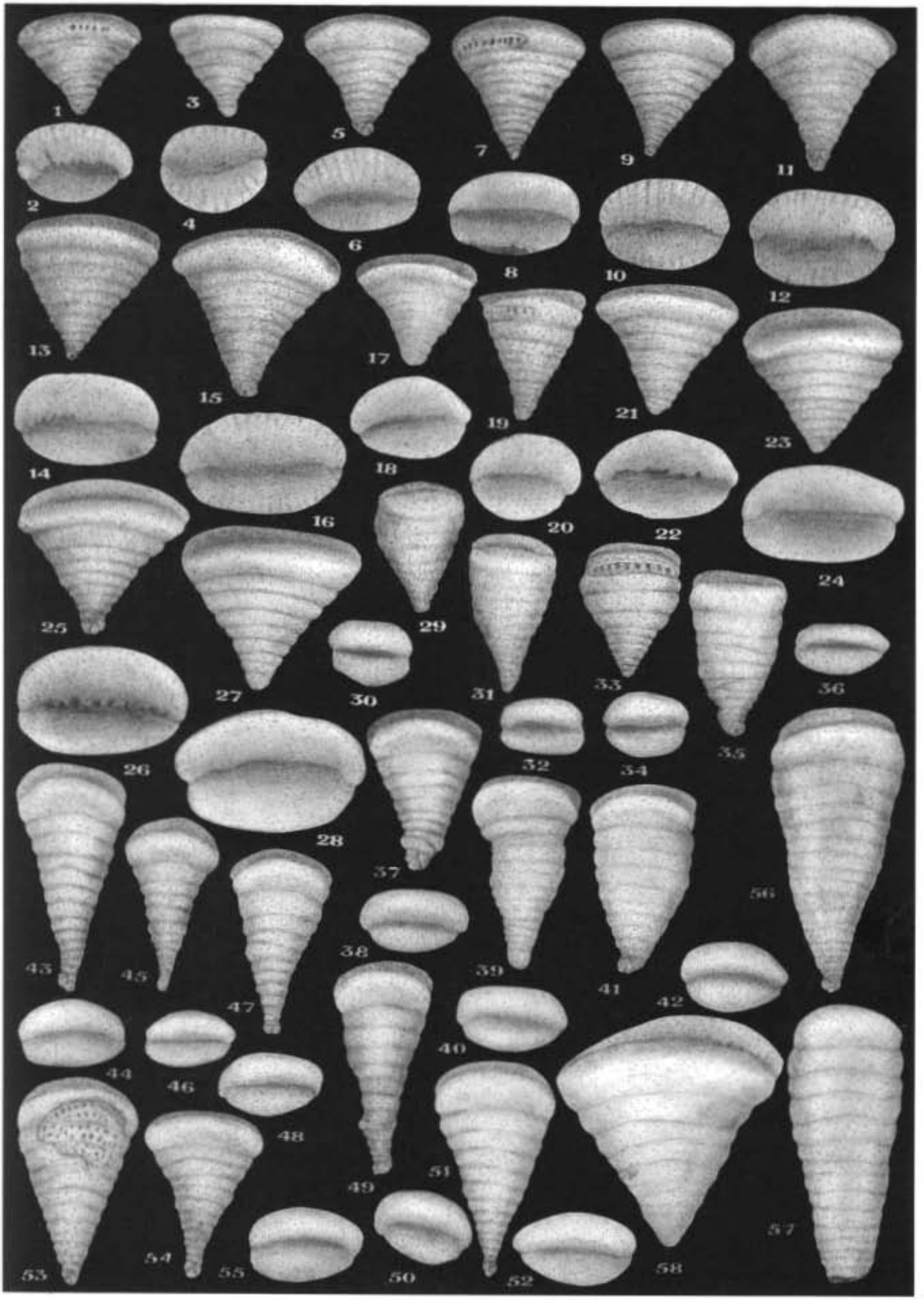
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PLATE 6

(SEM photographs; magnifications given by scale bars)

Figs 1-3. ***Scythiolina flabellii*** Neagu, n.sp., Uppermost Berriasian, ISPH drillings F.VIII Nazarcea -68.50 m, paratypes, L.P.B.IV.11.210.

Figs 4-5. ***Scythiolina crumenaeformae*** Neagu, n.sp., Uppermost Berriasian, Cernavoda, Ilie Barza's quarry, paratypes, L.P.B.IV.11.209.

Figs 6-10. ***Scythiolina infundibuliformae*** Neagu, n.sp., Uppermost Berriasian, ISPH drillings F.VIII Nazarcea -68.50m, paratypes, L.P.B.IV.11.215.

Figs 11-13. ***Scythiolina filiformae*** Neagu, n.sp., Lower Hauterivian, Alimanu's quarry, L.P.B.IV.11.214.

Figs 14-20. ***Scythiolina cuneata*** Neagu, n.sp., Lower Valanginian, Cernavoda Pod, right bank of the Danube River, paratypes, L.P.B.IV.11.214.

Figs 21-26. ***Histerolina pileiformae*** Neagu, n.sp., Uppermost Berriasian, ISPH drillings C.4 Hinog -47.20 m, paratypes, L.P.B.IV.11.228.

Figs 27-29. ***Histerolina paxilliformae*** Neagu, n.sp., Uppermost Berriasian, ISPH drillings F.IV Poarta Alba, -61.50 m, paratypes, L.P.B.IV.11.235.

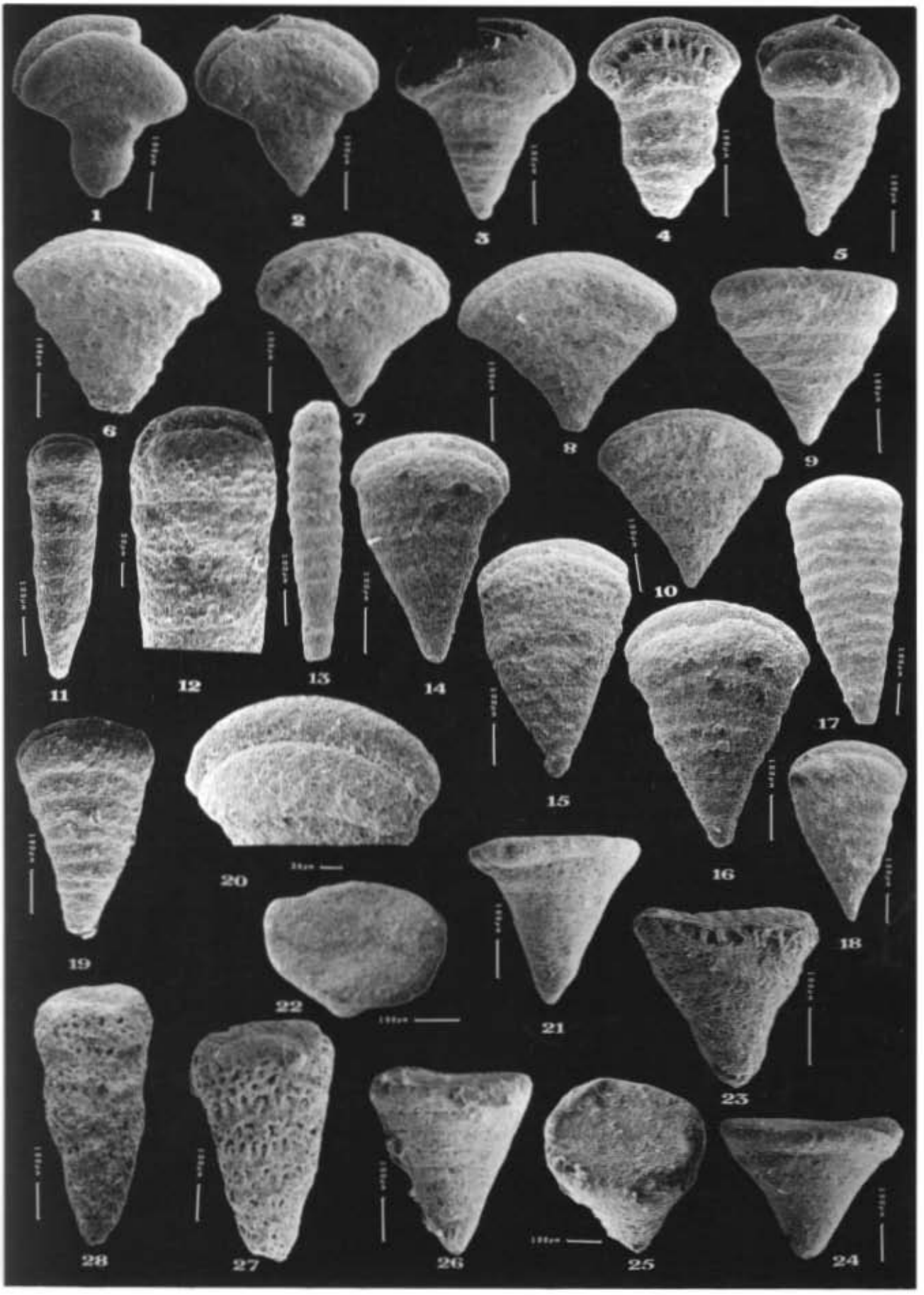
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PLATE 7

(thin sections, photographs in transmitted light, magnification = approx. x60)

Figs 1-5. ***Scythiolina flabellii*** Neagu, n.sp., Uppermost Berriasian, ISPH drillings F.VIII Nazarcea –68.50 m, paratypes, (Fig. 5, same specimen as illustrated in Pl. 2; Figs 50-51).

Figs 6, 25-34. ***Histerolina pileiformae*** Neagu, n.sp., Figs 6, 25, 28-32, 34, Lower Valanginian, Cernavoda Pod, right bank of the Danube River, paratypes, (Fig. 6 = Pl. 3; Fig. 65; Fig. 25 = Pl. 3, Figs 61-62; Fig. 28 = Pl. 3, Figs 63-64; Fig. 29 = Pl. 3, Fig. 68, Fig. 31 = Pl. 3, Fig. 67; Fig. 32 = Pl. 3, Figs 59-60; Fig. 30 = Pl. 5, Fig. 51), Figs 26-27, Uppermost Berriasian, ISPH drillings F.VIII Nazarcea -68,50 m., Fig. 33, ISPH drillings C.4 Hinog -44,30 m.

Figs 7-10. ***Scythiolina camposauri*** (Sartoni & Crescenti, 1962), Uppermost Berriasian, Cernavoda Pod, right bank of the Danube River, hypotypes, (Fig. 9, same specimen as illustrated in Pl. 2, Fig. 20).

Figs 11-15. ***Scythiolina crumenaeformae*** Neagu, n.sp., Fig. 11-12, 14 ISPH drillings F.VIII Nazarcea -68,50 m.; (Fig. 12, same specimen as illustrated in Pl. 2, Figs 40-41); Figs 13-15, ISPH drillings F.B. Ovidiu -76 m, paratypes.

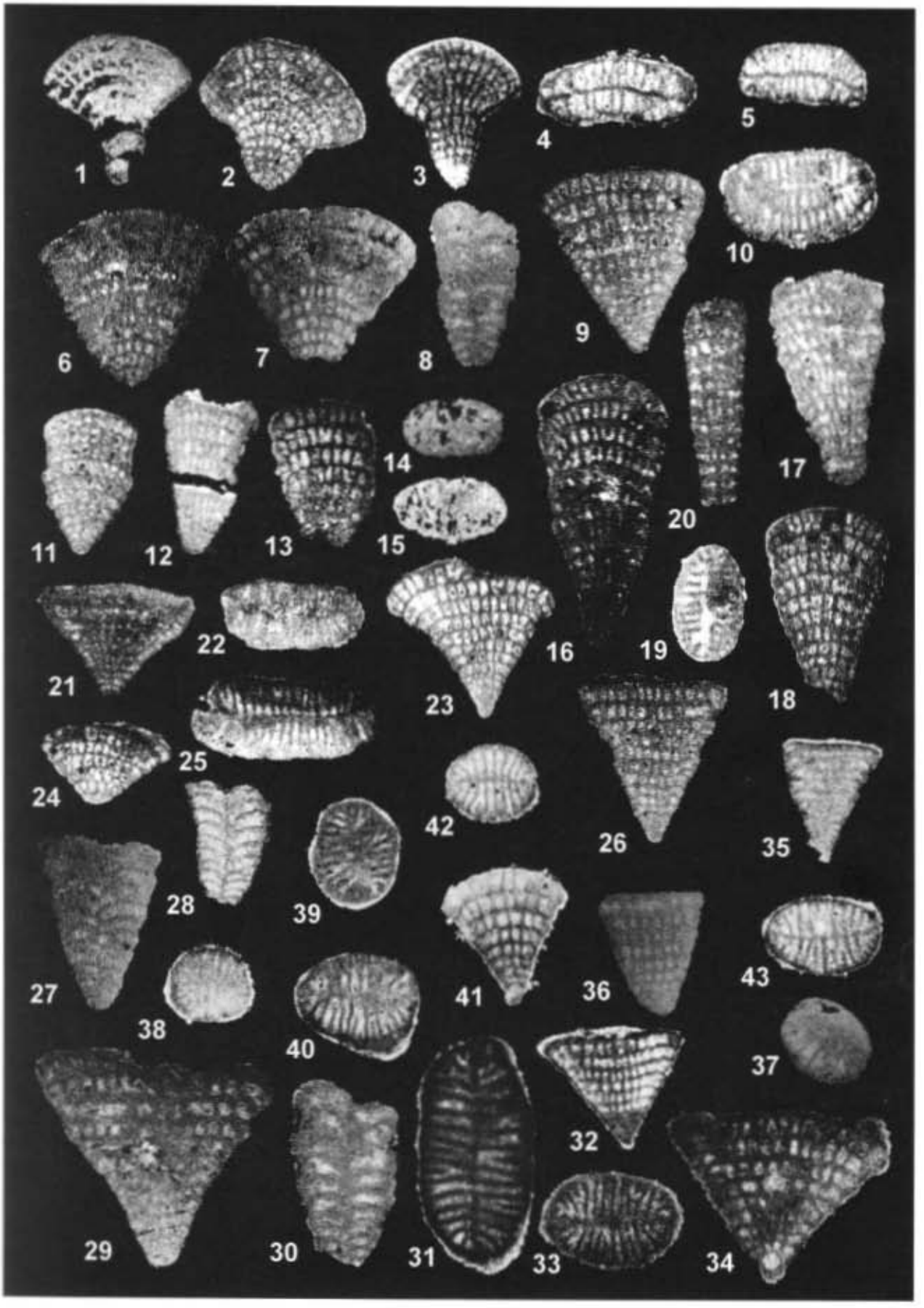
Figs 16-19. ***Scythiolina cuneata*** Neagu, n.sp., Fig. 18, Uppermost Berriasian, ISPH drillings F.VIII Nazarcea -68,50 m.; Figs 16-17, 19, Lower Valanginian, Cernavoda Pod, right bank of the Danube River (Fig. 16, same specimen as illustrated in Pl. 5, Fig. 56; Fig. 19 = Pl. 5, Fig. 57), paratypes.

Figs 20. ***Scythiolina filiformae*** Neagu, n.sp., Lower Hauterivian, Alimanu's quarry, paratype.

Figs 21-24. ***Scythiolina infundibuliformae*** Neagu, n.sp., Uppermost Berriasian, Figs 21-22, ISPH drillings F.VIII Nazarcea –68.50 m; Figs 23-24, Cernavoda Ilie Barza's quarry (Fig. 23, same specimen as illustrated in Pl. 1, Fig. 6), paratypes.

Figs 35-38. ***Histerolina paxilliformae*** Neagu, n.sp., Uppermost Berriasian; Fig. 35, ISPH drillings C.12 Hinog –92.20 to -93 m.; Figs 36-37, C.14 Hinog –47.20 m.; Fig. 38, F.VIII Nazarcea –68.50 m. (Fig. 36, same specimen as illustrated in Pl. 3, Figs 25- 26, Fig. 37 = Pl. 3, Figs 15-16), paratypes.

Figs 39-43. ***Histerolina ellipsiformae*** Neagu, n.sp., Uppermost Berriasian, ISPH drillings Figs 39-40, C.13 Hinog -49 m.; Fig. 41, F.IV. Poarta Alba –61.50 to -64 m.; Fig. 42, F.VIII Nazarcea –68.50 m. (Fig. 43, same specimen as illustrated in Pl. 3, Figs 55-58), paratypes.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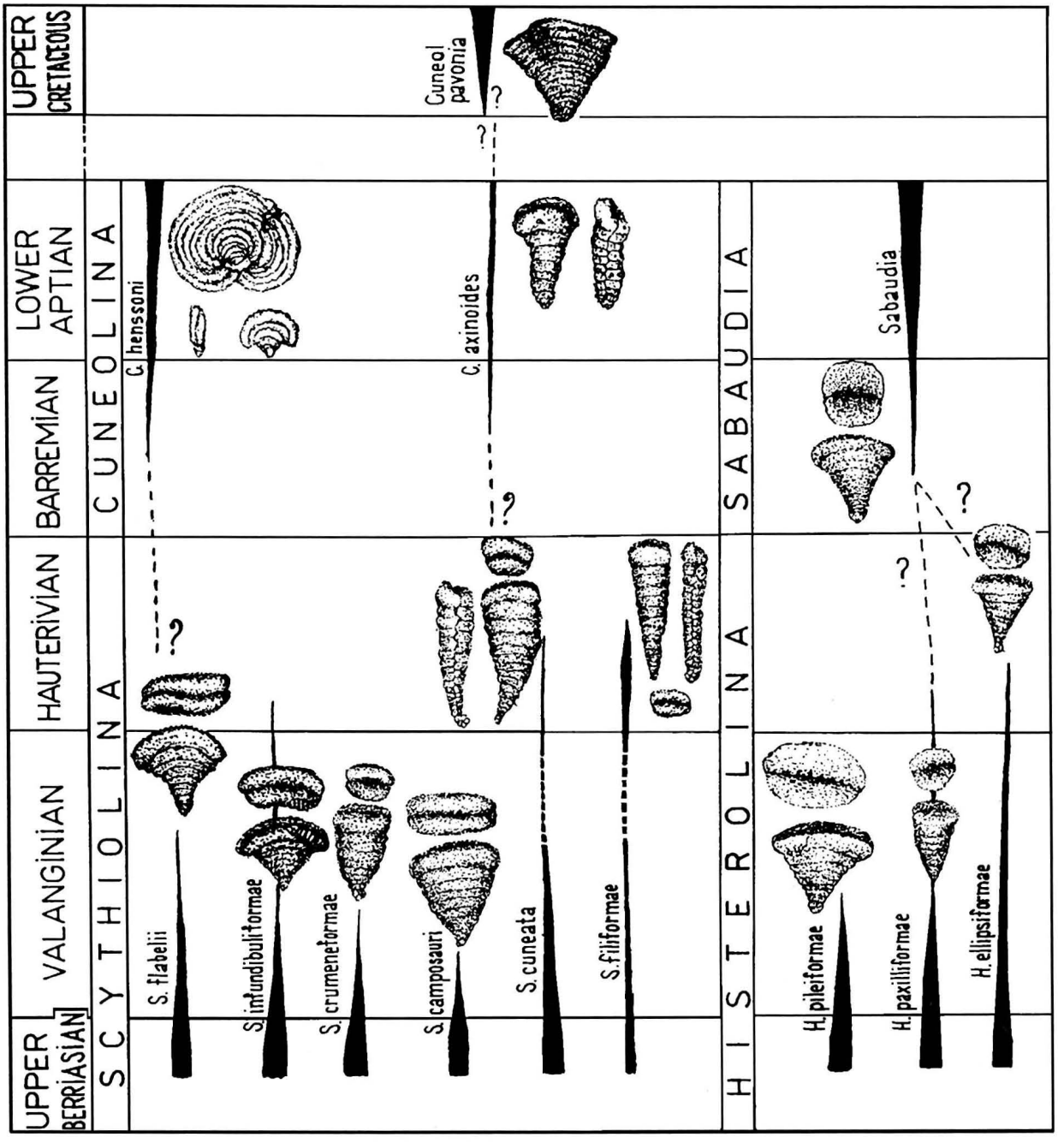

Figure 4. Stratigraphic ranges and possible phylogenetic evolution of some representatives of the Family Cuneolinidae in the Early Cretaceous.